quality and high reliability of the concerned type of ignition coil device is achieved.

Claims

1. An independent ignition type ignition coil for an internal combustion engine which is used after being inserted into a plug hole in the internal combustion engine and being directly coupled to a corresponding ignition plug and of which portion being inserted into the plug hole has an outer diameter of 18mm~27mm, and which includes a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in this order from the inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing, characterized in that between the primary coil bobbin and the primary coil and/or between layers of the primary coil a gap portion which reduces a stress component caused inside the secondary coil bobbin due to thermal contraction difference of the primary coil and the secondary coil bobbin among thermal stress caused inside the secondary coil bobbin is coexisted with the insulation use resin.

2. An independent ignition type ignition coil for an internal combustion engine which is used after being inserted into a plug hole in the internal

combustion engine and being directly coupled to a corresponding ignition plug and of which portion being inserted into the plug hole has an outer diameter of 18mm~27mm, and which includes a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in this order from the inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing, characterized in that the secondary coil bobbin is constituted by a denaturated PPE containing an inorganic filler material in an amount of not less than 20 weight % and between the primary coil bobbin and the primary coil and/or between layers of the primary coil a gap portion which reduces a stress component caused inside the secondary coil bobbin due to thermal contraction difference of the primary coil and the secondary coil bobbin among thermal stress caused inside the secondary coil bobbin is coexisted with the insulation use resin.

3. An independent ignition type ignition coil for an internal combustion engine which is used after being directly coupled to a corresponding ignition plug, and which includes a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in this order

from the inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing, characterized in that between the primary coil bobbin and the primary coil and/or between layers of the primary coil a gap portion which reduces a stress component cause inside the secondary coil bobbin due to thermal contraction difference of the primary coil and the secondary coil bobbin among thermal stress caused inside the secondary coil bobbin is coexisted with the insulation use resin.

4. An independent ignition type ignition coil for an internal combustion engine which is used after being directly coupled to a corresponding ignition plug, and which includes a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in this order from the inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing, characterized in that at least one between the primary coil bobbin and the insulation use resin filled between the primary coil bobbin and the primary coil, between the insulation use resin filled between the primary coil bobbin and the primary coil and the primary coil and between the primary coil and the insulation use resin filled between layers of the primary coil a peeling off portion is formed.

5. An ignition coil for an internal combustion engine according to one of claims 1 through 4, the secondary coil bobbin is constituted by 45 weight %~60 weight % of denaturated PPE, 15 weight %~25 weight % of glass fiber and 15 weight %~ 35 weight % of inorganic filler material in a non-fiber shape.

Sub B1 5

6. An ignition coil for an internal combustion engine according to one of claims 1 through 5, wherein a bobbin axial direction of the secondary coil bobbin corresponds to a resin flowing direction during molding of the resin, and an average linear expansion coefficient of the secondary coil bobbin in orthogonal direction with respect to the resin flowing direction is $35\sim75\times10^{-6}$ at temperatures $+30°C\sim-10°C$ according to a testing method conforming to ASTM D696.

7. An independent ignition type ignition coil for an internal combustion engine which is used after being directly coupled to a corresponding ignition plug, and which includes a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in this order from the inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing, characterized in that on the primary coil a cover film or a cover coating is applied which facilitates peeling off of the insulation use resin

filled around the primary coil from the primary coil.

8. An ignition coil for an internal combustion engine according to claim 7, wherein a cover film or a cover coating applied to said primary coil is a material having a small adhesion to the insulation use resin filled around said primary coil.

9. An independent ignition type ignition coil for an internal combustion engine which is used after being directly coupled to a corresponding ignition plug, and which includes a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in this order from the inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing, characterized in that on a side of bobbin surfaces of the primary coil bobbin on which the primary coil is wound a cover film or a cover coating which facilitates peeling off of the insulation use resin around the bobbin surface from the bobbin surface.

10. An ignition coil for an internal combustion engine according to claim 9, wherein a cover film or a cover coating applied on a side of bobin surfaces of said primary coil on which the primary coil is wounded is a material having a small adhesion to the insulation use resin filled around said primary coil.

11. An ignition coil for an internal combustion engine according to one of claim 7 through 10, wherein a material of the cover film or the cover coating is an insulation material containing one of nylon, polyethylene and teflon.

Sub B2

12. An ignition coil for an internal combustion engine according to one of claims 1 through 11, wherein the primary coil bobbin is constituted by a polybutylene terephthalate containing a rubber.

13. An ignition coil for an internal combustion engine according to one of claims 1 through 12, wherein the center core is coated with an insulation material having an elasticity before being disposed inside the secondary coil bobbin, and after the coated center core is disposed in the secondary coil bobbin a hard epoxy resin is filled between the center core and the secondary coil bobbin.

add C.7

add B3